Amendments to the Claims

This listing of claims will replace all prior version and listings of claims in the application:

Listing of Claims:

1. (Currently amended): A method for desorption and ionization of analytes, comprising the steps of:
   a. preparing a sample comprising analytes in a medium having at least one component;
   b. selecting a resonant vibrational mode of at least one component of the medium;
   c. selecting a laser ~~turned~~ tuned to emit light substantially at the wavelength of the selected vibrational mode; and
   d. irradiating the sample with the laser light to cause medium ablation and desorption and ionization of the analytes.

2. (Original): The method of claim 1, wherein the step of preparing a sample comprises a step of stabilizing the sample for compatibility with high-vacuum conditions.

3. (Original): The method of claim 2, wherein the stabilizing step comprises a step of freezing the sample at a sufficiently low temperature so that at least part of the sample has a phase transition.

4. (Original): The method of claim 3, wherein the freezing step comprises the steps of placing the sample in a sample support, and immersing the sample support in liquid nitrogen for a period of time so that any water within the sample changes to ice.

5. (Original): The method of claim 2, wherein the stabilizing step comprises a step of freezing the sample at a sufficiently low temperature so that at least part of the sample has an increase in viscosity and a decrease in vapor pressure.

6. (Original): The method of claim 1, wherein the step of preparing a sample comprises a step of spatially separating the analytes within the medium by electrophoresis, and the step of irradiating the sample comprises a step of irradiating sequentially a plurality of positions within the sample, wherein at least two irradiated positions correspond to locations of the spatially separated analytes.

7. (Original): The method of claim 6, wherein each of the plurality of positions is irradiated by laser light delivered in pulses, each pulse having a duration of less than the relaxation time of the selected vibrational mode, wherein the pulses are separated in time by intervals, each interval having a duration of at least ten times the relaxation time of the selected vibrational mode.

8. (Original): The method of claim 6, wherein each of the plurality of positions is irradiated by laser light delivered in pulses, each pulse having a duration of less than a thermal relaxation time of the at least one component of the medium.

9. (Original): The method of claim 6, wherein each of the plurality of positions is irradiated by laser light delivered in pulses, each pulse having a duration of less than a mechanical relaxation time of the at least one component of the medium.

10. (Original): The method of claim 1, wherein the step of selecting a resonant vibrational mode comprises a step of locating the resonant vibrational mode from a Fourier-transform infrared absorption spectrum of the medium.

11. (Original): The method of claim 1, wherein the step of irradiating the sample with the laser light comprises a step of delivering the laser light in pulses, wherein the pulses are separated in time by intervals, each interval having a duration of at least ten times the relaxation time of the selected vibrational mode.

12. (Original): The method of claim 11, further comprising a step of moving the sample in a relative motion back and forth to the laser light to form a rastering trace such that the desorption and ionization of the analytes occur substantially at a same region in space.

13. (Original): The method of claim 1, wherein the medium includes an electrophoresis medium.

14. (Original): The method of claim 13, wherein the electrophoresis medium comprises polyacrylamide.

15. (Original): The method of claim 1, wherein the step of preparing a sample comprises a step of stabilizing the sample for compatibility with atmospheric pressure conditions.

16. (Original): The method of claim 1, further comprising the steps of:
   a. passing the ionized analytes through a mass spectrometer; and
   b. obtaining a mass spectrum of the ionized analytes.

17. (Original): A system for desorption and ionization of analytes, comprising:
   a. means for preparing a sample comprising analytes in a medium having at least one component;
   b. means for selecting a resonant vibrational mode of at least one component of the medium;

c. means for tuning a laser to emit light substantially at the wavelength of the selected vibrational mode; and

d. means for irradiating the sample to cause medium ablation and desorption and ionization of the analytes.

18. (Original): The system of claim 17, wherein the preparing means includes means for freezing the sample at a sufficiently low temperature so that at least part of the sample has a phase transition.

19. (Original): The system of claim 17, wherein the preparing means includes means for freezing the sample at a sufficiently low temperature so that at least part of the sample has an increase in viscosity and a decrease in vapor pressure.

20. (Original): The system of claim 17, wherein the irradiating means includes means for delivering light in pulses, each pulse having a duration of less than the relaxation time of the selected vibrational mode, wherein the pulses are separated in time by intervals, each interval having a duration of at least ten times the relaxation time of the selected vibrational mode.

21. (Original): The system of claim 17, wherein the irradiating means includes means for delivering light in pulses, each pulse having a duration of less than a thermal relaxation time of the at least one component of the medium.

22. (Original): The system of claim 17, wherein the irradiating means includes means for delivering light in pulses, each pulse having a duration of less than a mechanical relaxation time of the at least one component of the medium.

23. (Original): A method for desorption and ionization of analytes, comprising the steps of:

a. preparing a sample having analytes and a polyacrylamide medium having at least one component;

b. selecting a resonant vibrational mode of at least one component of the medium;

c. selecting a laser tuned to emit light substantially at the wavelength of the selected vibrational mode; and

d. irradiating the sample with laser light to cause medium ablation and desorption and ionization of the analytes.

24. (Original): The method of claim 23, wherein the laser emits light at a wavelength greater than 4.5 micrometers and less than 10.0 micrometers.

25. (Original): The method of claim 23, wherein the laser emits light at a wavelength greater than 5.7 micrometers and less than 6.5 micrometers.

26. (Original): The method of claim 23, wherein the laser emits light at a wavelength greater than 6.7 micrometers and less than 7.3 micrometers.

27. (Original): The method of claim 23, wherein the laser emits light at a wavelength greater than 7.3 micrometers and less than 9.8 micrometers.

28. (Original): The method of claim 23, wherein the sample is irradiated by laser light delivered in pulses, each pulse having a duration of less than 5.0 picoseconds, wherein the pulses are separated in time by more than 100 picoseconds.

29. (Original): The method of claim 23, wherein the step of preparing a sample comprises a step of stabilizing the sample for compatibility with high-vacuum conditions.

30. (Currently amended): ~~The method of claim 29,~~ A method for desorption and ionization of analytes, comprising the steps of:

a. preparing a sample having analytes and a polyacrylamide medium having at least one component;

b. selecting a resonant vibrational mode of at least one component of the medium;

c. selecting a laser tuned to emit light substantially at the wavelength of the selected vibrational mode; and

d. irradiating the sample with laser light to cause medium ablation and desorption and ionization of the analytes,

wherein the preparing step comprises a step of stabilizing the sample for compatibility with high-vacuum conditions, wherein the stabilizing step comprises a step of freezing the sample at a sufficiently low temperature so that at least part of the sample has a phase transition.

31. (Original): The method of claim 30, wherein the freezing step comprises the steps of placing the sample in a sample support, and immersing the sample support in liquid nitrogen for a period of time so that any water within the sample changes to ice.

32. (Currently amended): ~~The method of claim 29,~~ A method for desorption and ionization of analytes, comprising the steps of:

e. preparing a sample having analytes and a polyacrylamide medium having at least one component;

f. selecting a resonant vibrational mode of at least one component of the medium;

g. selecting a laser tuned to emit light substantially at the wavelength of the selected vibrational mode; and

h. irradiating the sample with laser light to cause medium ablation and desorption and ionization of the analytes,

wherein the preparing step comprises a step of stabilizing the sample for compatibility with high-vacuum conditions, wherein the stabilizing step comprises a step of freezing the sample at a sufficiently low temperature so that at least part of the sample has an increase in viscosity and a decrease in vapor pressure.

33. (Original): The method of claim 23, wherein the step of preparing a sample comprises a step of stabilizing the sample for compatibility with atmospheric pressure conditions.

34. (Original): The method of claim 23, wherein the step of preparing a sample comprises a step of spatially separating the analytes within the medium by electrophoresis, and the step of irradiating the sample comprises a step of irradiating sequentially a plurality of positions within the sample, wherein at least two irradiated positions correspond to locations of the spatially separated analytes.

35. (Original): The method of claim 34, wherein each of the plurality of positions is irradiated by laser light delivered in pulses, each pulse having a duration of less than the relaxation time of the selected vibrational mode, wherein the pulses are separated in time by intervals, each interval having a duration of at least ten times the relaxation time of the selected vibrational mode.

36. (Original): The method of claim 34, wherein each of the plurality of positions is irradiated by laser light delivered in pulses, each pulse having a duration of less than a thermal relaxation time of the at least one component of the medium.

37. (Original): The method of claim 34, wherein each of the plurality of positions is irradiated by laser light delivered in pulses, each pulse having a duration of less than a mechanical relaxation time of the at least one component of the medium.

38. (Original): The method of claim 23, wherein the step of selecting a resonant vibrational mode comprises a step of locating the resonant vibrational mode from a Fourier-transform infrared absorption spectrum of the polyacrylamide medium.

39. (Original): The method of claim 23, further comprising the steps of:
    a. passing the ionized analytes through a mass spectrometer; and
    b. obtaining a mass spectrum of the ionized analytes.

40. (Original): A system for desorption and ionization of analytes, comprising:
    a. means for preparing a sample having analytes and a polyacrylamide medium having at least one component;
    b. means for selecting a resonant vibrational mode of at least one component of the medium;
    c. means for tuning a laser to emit light substantially at the wavelength of the selected vibrational mode; and
    d. means for irradiating the sample with laser light to cause medium ablation and desorption and ionization of the analytes.

41. (Original): The system of claim 40, wherein the preparing means includes means for stabilizing the sample for compatibility with high-vacuum conditions.

42. (Original): The system of claim 40, wherein the irradiating means includes means for delivering light in pulses, each pulse having a duration of less than the relaxation time of the selected vibrational mode, wherein the pulses are separated in time by intervals, each interval having a duration of at least ten times the relaxation time of the selected vibrational mode.

43. (Original): The system of claim 40, wherein the irradiating means includes means for delivering light in pulses, each pulse having a duration of less than a thermal relaxation time of the at least one component of the medium.

44. (Original): The system of claim 40, wherein the irradiating means includes means for delivering light in pulses, each pulse having a duration of less than a mechanical relaxation time of the at least one component of the medium.

45. (Original): The system of claim 40, further comprising means for obtaining a mass spectrum of the ionized analytes.

46. (Canceled).

47. (Currently amended): The method of ~~claim 46~~ claim 62, further comprising the steps of:

   a. selecting a resonant vibrational mode of at least one component of the medium; and
   b. selecting an energy source to emit short-pulse radiation substantially at the wavelength of the selected resonant vibrational mode.

48. (Original): The method of claim 47, wherein the energy source is a laser.

49. (Original): The method of claim 48, wherein the laser is a free electron laser.

50. (Original): The method of claim 49, wherein the free electron laser is tunable to generate short-pulse radiation.

51. (Original): The method of claim 48, wherein the laser is a solid state laser.

52. (Original): The method of claim 51, wherein the solid state laser is tunable to generate short-pulse radiation.

53. (Original): The method of claim 48, wherein the laser is a gas laser.

54. (Original): The method of claim 48, wherein the laser is a metal vapor laser.

55. (Original): The method of claim 47, wherein the step of selecting a resonant vibrational mode comprises a step of locating the resonant vibrational mode from a Fourier-transform infrared absorption spectrum of the medium.

56. (Currently amended): The method of ~~claim 46~~ claim 62, wherein the freezing step comprises the steps of placing the sample in a sample support, and immersing the sample support in liquid nitrogen for a period of time so that any water within the sample has a phase transition to change to ice.

57. (Currently amended): ~~The method of claim 46,~~ A method for desorption and ionization of analytes, comprising the steps of:

a. preparing a sample having analytes in a medium including at least one component;

b. freezing the sample at a sufficiently low temperature so that at least part of the sample has an increase in viscosity and a decrease in vapor pressure; and

c. irradiating the frozen sample with short-pulse radiation to cause medium ablation and desorption and ionization of the analytes,

wherein the step of preparing a sample comprises a step of spatially separating the analytes within the medium by electrophoresis.

58. (Original): The method of claim 57, wherein the step of irradiating the frozen sample comprises a step of irradiating sequentially a plurality of positions within the frozen

sample, wherein at least two irradiated positions correspond to locations of the spatially separated analytes.

59. (Original): The method of claim 58, wherein each of the plurality of positions is irradiated by radiation delivered in pulses, each pulse having a duration of less than the relaxation time of a selected vibrational mode of at least one component of the medium, wherein the pulses are separated in time by intervals, each interval having a duration of at least ten times the relaxation time of the selected vibrational mode.

60. (Original): The method of claim 58, wherein each of the plurality of positions is irradiated by radiation delivered in pulses, each pulse having a duration of less than a thermal relaxation time of the at least one component of the medium.

61. (Original): The method of claim 58, wherein each of the plurality of positions is irradiated by radiation delivered in pulses, each pulse having a duration of less than a mechanical relaxation time of the at least one component of the medium.

62. (Currently amended): ~~The method of claim 46,~~ A method for desorption and ionization of analytes, comprising the steps of:

   a. preparing a sample having analytes in a medium including at least one component;
   b. freezing the sample at a sufficiently low temperature so that at least part of the sample has an increase in viscosity and a decrease in vapor pressure; and
   c. irradiating the frozen sample with short-pulse radiation to cause medium ablation and desorption and ionization of the analytes,

wherein the medium includes an electrophoresis medium.

63. (Original): The method of claim 62, wherein the electrophoresis medium comprises polyacrylamide.

64. (Currently amended): The method of ~~claim 46~~ claim 62, further comprising the steps of:
    a. passing the ionized analytes through a mass spectrometer; and
    b. obtaining a mass spectrum of the ionized analytes.

65. (Canceled).

66. (Currently amended): The system of ~~claim 65~~ claim 74, further comprising:
    a. means for selecting a resonant vibrational mode of at least one component of the medium; and
    b. means for selecting an energy source tuned to emit short-pulse radiation substantially at the wavelength of the selected resonant vibrational mode.

67. (Original): The system of claim 66, wherein the energy source is a laser.

68. (Original): The system of claim 67, wherein the laser is a free electron laser.

69. (Original): The system of claim 68, wherein the free electron laser is tunable to generate short-pulse radiation.

70. (Original): The system of claim 67, wherein the laser is a solid state laser.

71. (Original): The system of claim 70, wherein the solid state laser is tunable to generate short-pulse radiation.

72. (Original): The system of claim 66, wherein means for selecting a resonant vibrational mode comprises means for locating the resonant vibrational mode from a Fourier-transform infrared absorption spectrum of the medium.

73. (Currently amended): The system of ~~claim 65~~ claim 74, wherein the freezing means includes a sample support to contain the sample, and the sample support being immersed in liquid nitrogen for a period of time so that any water within the sample has a phase transition to change to ice.

74. (Currently amended): ~~The system of claim 65,~~ A system for desorption and ionization of analytes, comprising:
    a. means for preparing a sample having analytes in a medium including at least one component;
    b. means for freezing the sample at a sufficiently low temperature so that at least part of the sample has an increase in viscosity and a decrease in vapor pressure; and
    c. means for irradiating the frozen sample with short-pulse radiation to cause medium ablation and desorption and ionization of the analytes,

    wherein the medium includes an electrophoresis medium.

75. (Original): The system of claim 74, wherein the electrophoresis medium comprises polyacrylamide.

76. (Currently amended): The system of ~~claim 65~~ claim 74, further comprising means for obtaining a mass spectrum of the ionized analytes.

77. (Currently amended): A system for desorption and ionization of analytes, comprising:
    a. a support for holding a sample of analytes in a medium;
    b. a laser source emitting light corresponding to a selected vibrational mode of at least one component of the medium;
    c. optics elements directing the emitted light to irradiate the sample to cause medium ablation and desorption and ionization of the analytes;

d. an ion accelerator for injecting the ionized analytes into a mass spectrometer;

e. a mass spectrometer that separates the accelerated ionized analytes according to their masses;

f. a detector for the mass determination of ionized analytes separated according to their masses;

g. data collection equipment for recording of the spectrum of determined masses; and

h. data presentation equipment for displaying of the spectrum of determined [[masses.]]masses,

wherein the support for holding a sample of analytes includes means for moving the sample in a relative motion back and forth to the laser light to form a rastering trace such that the desorption and ionization of the analytes occur substantially at a same region in space.

78. (Original): The system of claim 77, wherein the laser source emits light in pulses, each pulse having a duration of less than 5.0 picoseconds, wherein the pulses are separated in time by more than 100 picoseconds.

79. (Canceled).

80. (Currently amended): The system of ~~claim 79~~ claim 77, wherein the detector and data collection equipment are in communication with the irradiating means such that the spectrum of determined masses at each position is separately recorded.